

**Summary Report to Congress
on Implementation of the Central Valley Project Improvement Act
Six-Year Accomplishment Report
Fiscal Years 1993-1998**

June 2000

**U.S. Department of the Interior
Bureau of Reclamation
Fish and Wildlife Service**

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Abbreviations and Acronyms

ACID	Anderson-Cottonwood Irrigation District
Act	Central Valley Project Improvement Act
AFRP	Anadromous Fish Restoration Program
AFSP	Anadromous Fish Screen Program
CALFED	California-Federal (as in CALFED Bay-Delta Program)
CAMP	Comprehensive Assessment and Monitoring Program
CD-ROM	compact disc read-only memory
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
Delta	Sacramento-San Joaquin River Delta
DFG	California Department of Fish and Game
DWR	California Department of Water Resources
EA	environmental assessment
EIS/EIR	environmental impact statement/environmental impact report
ESA	Endangered Species Act
FONSI	finding of no significant impact
FY	fiscal year
GCID	Glenn-Colusa Irrigation District
GIS	geographic information system
Interior	U.S. Department of the Interior
Joint Venture	Central Valley Habitat Joint Venture
M&I	municipal and industrial
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
OCAP	operating criteria and plan
PEIS	programmatic environmental impact statement
PG&E	Pacific Gas and Electric Company
RBDD	Red Bluff Diversion Dam
RCD	resource conservation district
Restoration Fund	Central Valley Project Restoration Fund
SB	Senate Bill
Service	U.S. Fish and Wildlife Service
SWP	State Water Project
SWRCB	State Water Resources Control Board
TCD	temperature control device
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey
VAMP	Vernalis Adaptive Management Plan

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PART I - INTRODUCTION

Purpose of Six-Year Report

This report is a summary of the actions taken by the Secretary of the Interior to implement Title 34 of Public Law 102-575, the Central Valley Project Improvement Act (CVPIA or Act), passed by Congress on October 30, 1992. It is a report of what has been accomplished, and the progress toward achievement of the intent, purposes and provisions of the CVPIA since its passage.

Significant progress has been made. Interior has given the highest priority to CVPIA implementation, and programs are in place to carry out all of the Act's key provisions. Some of the prescribed actions have been completed, and others are in progress. This report gives an overview of the accomplishments to date.

The status of major programs is summarized in Part V, Summary Table of Accomplishments, which shows the CVPIA Section that relates to the program, the name of the program, and a brief summary of the status. An Appendix follows, which provides details of the status of individual programs, in the same order they are presented in Part V.

CVP's Role in California's Water Resources

For nearly three-quarters of the last century, California has depended on the CVP for a large part of its water needs, particularly for agriculture. Plagued by consecutive years of drought followed by wet years often bringing floods, the state relies heavily on dams and reservoirs to help balance and control its water resources. The climate and geography make the state equally dependent on water distribution systems to balance supplies with water needs.

Much of the state's water originates in the north and is conveyed southward, primarily through the Sacramento River system and its tributaries.

Some water is diverted along the way, and the rest flows into the Bay-Delta estuary, where about half of it is pumped south and the remainder discharges to San Francisco Bay and the Pacific Ocean. CVP water commingles with other water supplies. Thus, the CVP affects, and is affected by, the many unresolved water issues in California involving ecosystem balance in the river systems and the Delta.

The sensitive ecosystem of the San Francisco Bay Delta may be affected by water diversions, particularly in drought years, and the courts have intervened to assure that adequate fresh water enters this system. Complying with the Endangered Species Act also necessitates releases from dams to regulate water temperatures and in-stream flows, and restrictions on water diversions to protect anadromous fish when certain runs are imperiled from pumps or diversions. These factors have greatly increased the competition for existing water supplies, and have focused new scrutiny on the way water resources are being used.

Conditions have greatly changed since the CVP was started in 1930. Population growth and development have increased farm, urban and industrial water demands. Stocks of fish and wildlife have declined, and some species are endangered or threatened because of severe habitat losses from various kinds of development over the last century, including water projects. There is a new imperative for resource management to include ecological stewardship.

These are complex issues that can only be resolved cooperatively, by involving the public and all stakeholders in the process. Whenever water is gained for one purpose, it is viewed as lost for another. Negotiation and compromise are vital to reduce conflicts and improve water management for all needs.

The Central Valley Project



Beginning in 1930 the federal government built the Central Valley Project (CVP) in California to control floods and to store and distribute water for the agricultural development of the great Central Valley. Today, the CVP delivers about 20 percent of California's developed water to farms and communities, and generates about 5 billion kilowatt hours of hydroelectric power. The CVP supplies about 7 million acre-feet of water, transported via canals, aqueducts, and the river systems of the Sacramento and San Joaquin Rivers.

(One acre-foot is the amount needed to cover an area the size of a football field in water one foot deep. One acre-foot--about 326,000 gallons--will supply all the water needs of an average family of five for a year, or drip-irrigate about one acre of grape vines.)

The CVPIA Mandate

The CVPIA addressed the importance of the CVP in California's water resources and made significant changes in the policies and administration of the CVP – more so than any other legislation during the CVP's 69-year history. The CVPIA has redefined the purposes of the CVP to include protection, restoration and

enhancement of fish, wildlife and associated habitats, and protection of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. Overall, the CVPIA seeks to "achieve a reasonable balance among competing demands for use of [CVP] water, including the requirements of fish and wildlife, agricultural, municipal and industrial and power contractors."

PART II - INTERIOR'S IMPLEMENTATION APPROACH

Implementing the CVPIA

Immediately upon passage of the CVPIA, the Secretary of the Interior began to develop policies and procedures to implement the specific provisions of the Act.

Interior first developed a set of procedural objectives designed to achieve the stated goals while providing the greatest public benefit and minimizing adverse impacts. The objectives also put high priority on forming partnerships and coordinating with other efforts. Another objective was to use funds in the most cost-effective manner.

Interior also adopted three fish and wildlife restoration objectives directly from the Act. One of the most ambitious objectives was to make all reasonable efforts to double the natural production of anadromous fish. Another was to supply water to Central Valley refuges and other migratory waterfowl habitats. The third was to mitigate for other identified impacts of the CVP.

On behalf of the Secretary, specific actions were then implemented by the U.S. Bureau of Reclamation (Reclamation) and the U.S. Fish and Wildlife Service (Service). One of the first steps was to develop administrative procedures and guidelines to carry out the objectives.

Coordination with Other Programs

To assure coordination within Interior, each section of the Act was assigned a program manager from each of the two agencies, Reclamation and the Service. Generally, one is designated the lead agency, but both have equal responsibility to work together to develop a program plan and to involve other agencies and interested groups in its development and refinement.

To achieve cooperation with other ongoing programs, Interior has developed extensive partnerships with local, state and federal agencies, and private groups. These partnerships include various existing programs, as well as new programs formed to carry out CVPIA mandates.

Some of the concurrent programs affecting CVPIA are the Coordinated Operation Agreement between the CVP and the State Water Project (SWP) to meet Delta water quality and flow standards; the Bay-Delta Accord agreeing to those standards, and the Category III habitat program established under the accord; and CALFED, a consortium of federal and state agencies working with stakeholders and interest groups to develop alternatives for a long-term solution to Delta problems. CALFED is also involved in habitat restoration projects.

Implementation Priorities

Priorities for actions to implement the CVPIA were set based on several factors: the importance of the action to program goals; individual conditions, such as planning needed or readiness for implementation; coordination with other ongoing programs; and funding. Some sections of the Act direct specific actions, some call for studies or investigations, and others relate to administrative matters, such as authorization of funds and compliance with state and federal laws. The Act specified compliance dates for some actions, so implementation in those cases was responsive to the prescribed dates.

MAJOR PROGRAMS INFLUENCING CVPIA IMPLEMENTATION

Coordinated Operation Agreement - 1986

USBR-DWR agreement defining responsibilities of CVP and SWP to meet Delta water quality and flow standards set by State Water Resources Control Board (SWRCB). (SWRCB is in the process of determining contributions of other water right holders.)

Bay-Delta Accord - 1994

Interim agreement on Delta water quality standards reached by federal and state agencies, urban and agricultural water users and environmentalists. The accord established a Category III habitat program to address non-flow issues such as fish screens. (3-year agreement extended each year since 1997)

CALFED - 1996

A consortium of state and federal agencies (appointed by the Secretary of the Interior and the Governor) working with other urban, agricultural, fishery and environmental representatives to solve Delta water quality and reliability problems. CALFED is developing alternative plans for a long term solution. CALFED's Ecosystem Restoration Program Plan (ERPP) has approved ecosystem restoration projects upstream and in the Delta.

The Act required a Programmatic Environmental Impact Statement (PEIS) to assess the effects of implementing the actions specified in the CVPIA. Because the findings of the PEIS would influence many of the actions, the PEIS was among the first steps and proceeded concurrently with other early actions needed to carry out the implementation. The PEIS process provided early public involvement and input for many of the individual programs, and is now nearing completion. The final PEIS was completed in October 1999.

Most of the programs to address specific CVPIA sections had the same initial steps in common. All required an administrative structure, and public involvement and partnering coordination to develop a program plan. Because of relative complexity and degree of public interest or controversy, there was great variation among programs in the time and effort required to complete these steps. For some programs the plan was developed within the first year, while for others program plans are still being completed.

Interior is implementing the Act to provide immediate response to the needs of the most threatened species of fish and wildlife, while taking care to involve all stakeholders in the development and implementation of all programs mandated by the CVPIA.

To prioritize activities and funds, Interior developed biological focus areas. The focus areas are based on integration of three parameters: the species of greatest concern, factors most influencing those species populations, and the geographic areas or habitats critical to those populations. Interior channeled its efforts to areas where the three parameters overlap to focus funds and gain the most biological benefit.

An Urgent Priority: Shasta Temperature Control Device

In some cases, urgency gave a project high priority. Interior was responsive to such an exigency in the planning and construction of the Shasta Temperature Control Device (TCD). Millions of dollars in power revenues were being lost in summer and fall when cold water had to be released from low outlets at Shasta Dam to benefit federally listed winter-run salmon. A solution was needed that would send cold water downstream

without interrupting power generation. Reclamation began research to solve this problem in 1989.

The solution was an \$80 million steel frame structure that allows the selective withdrawal of water from different reservoir depths without bypassing power generation. The 8,000-ton, 300-foot-tall structure is connected to the upstream face of the dam. It has been compared with building a 25-story steel skyscraper under water. Construction required a team of divers using a diving bell and a pressurized living chamber at the surface to allow “saturation diving” at depths to 300 feet.

Despite the technological challenges of this pioneering and unique project, planning and design were completed within two years after CVPIA passage. Construction began in November of 1994 and the TCD was operating in February 1997. Since then, the TCD has operated to reduce temperatures in the upper Sacramento River, while allowing power generation. Although this project required a large commitment of CVPIA funds, the otherwise-lost power revenues will eventually pay for this project.



Shasta Temperature Control Device, Dam, and Powerplant. The five TCD bays are on the right center, and the low-level intake support structure is on the left.

PART III - SUMMARY OF ACCOMPLISHMENTS

Organization of CVPIA Implementation Actions

Interior grouped the actions in individual sections of the CVPIA into eight categories for administration and budgeting. These categories are commonly used in partnering and public involvement discussions, though each one involves many individual programs and actions. These categories will also be used to group related actions for the summary of accomplishments that follows.

CVPIA ACTION CATEGORIES

- Administrative Processes
- Contracting and Improved Water Management
- Anadromous Fish--Habitat Restoration
- Anadromous Fish--Structural Measures
- Refuges and Waterfowl
- Other Fish and Wildlife
- Monitoring
- Studies, Investigations, and Modeling

A Summary Table of Accomplishments in Part V presents the major accomplishments of CVPIA implementation in a concise tabular form. Anadromous fish and terrestrial restoration activities associated with these accomplishments are shown on maps following the Summary Table. More detailed information on each individual program is provided in the Appendix, in the same order as Action Categories and Part V.

Administrative Processes

The administrative processes of the CVPIA include developing and implementing rules and regulations, preparing the PEIS, and funding.

The administrative element of implementing the CVPIA has been extremely challenging for all the agencies involved, and has required a large commitment of resources over the past six years, because of the many comprehensive programs to be implemented. Many programs have required extensive documentation and reports for environmental compliance, in addition to those required for the PEIS. Public involvement and partnering arrangements have also been extensive.

Because of Interior's strong commitment to

implementation, and the enthusiastic cooperation of partnering agencies, including the State of California, many of the programs have advanced rapidly and others are nearing completion of the administrative groundwork. In view of the complexity and controversial nature of the CVPIA to CVP contractors and other stakeholders, it has been extremely important to work together to establish the rules and regulations. In reviewing the progress of implementation, it will be apparent that some of the more contested actions required more time for the administrative steps.

Rules and Regulations

Interior has been conducting a public involvement process to develop the necessary rules and regulations. Interior first developed interim guidelines and/or criteria for ten CVPIA sections, and then held public scoping workshops to solicit comments on rulemaking. Final rules will be developed when the PEIS process is completed.

Administrative Proposals

In response to public meetings held in 1995 and 1996, Interior established a public forum process to provide administrative proposals on issues that stakeholders identified as significant areas of concern. Of 10 proposals, nine have been completed. These administrative proposals inform the public and provide Interior with interim direction for interpreting sections of the CVPIA.

The nine administrative proposals completed in 1997 and 1998 include: Trinity River, Water Conservation, Urban Reliability, San Joaquin River, Stanislaus River, Section 3406(b)(2)--dedicated water--combined with AFRP, Water Transfers, Contracting Policies, and Refuge Water Supplies. The Restoration Fund proposal is now being completed.

One of the more controversial administrative proposals studied by a team of Interior personnel and stakeholders concerned management of the 800,000 acre-feet of dedicated yield [Section 3406(b)(2)]. The recommendations of this group were submitted to Interior and, on July 6, 1996, Interior released a draft administrative proposal for review and comments. The final proposal was released in November 1997.

Because a primary purpose of the dedicated yield was for fish restoration, the administrative

proposal for the Anadromous Fish Restoration Program (AFRP) was combined with the dedicated yield proposal, commonly referred to as "b-2". In an appendix the proposal also includes operating criteria used in modeling simulations that will be incorporated into a new CVP Operating Criteria and Plan (OCAP).

Despite the lengthy public involvement process and Interior's best efforts to move the participants toward consensus, some groups are still contesting the proposed management of dedicated yield. The strong feelings on this issue--some CVP users believing the formula will result in too much water dedicated to fish, and environmental groups, too little--is indicative of the high-stakes game water is in California. Because of the critical importance of water supplies to all stakeholders, gaining consensus for implementation of the CVPIA has not been possible in all circumstances.

This example demonstrates the extensive and continuing public involvement, and the interactions between various CVPIA sections, that make up the record for developing rules and regulations for CVPIA implementation. The issues identified during the preparation and review of the PEIS are also part of the administrative record. Final rules will be developed following the Record of Decision on the PEIS.

Programmatic Environmental Impact Statement (PEIS)

The draft PEIS, which analyzes the direct and indirect impacts of implementing the CVPIA, was the most comprehensive document to be prepared for CVPIA implementation, and required partnering with nine agencies, extensive public involvement, and significant technical efforts. The draft, including more than 30 technical appendices, was released for public comment in November 1997. The final PEIS is scheduled for completion in 1999.

Funding Arrangements

Funding for CVPIA comes from several sources, and these have been formalized in written agreements and planning processes. Three funding mechanisms are proposed in CVPIA and have been established: Restoration Fund, cost-

share agreement with the State of California, and funding agreements with non-federal entities. Most CVPIA projects are funded by the Restoration Fund; however, some have been funded wholly or partially from Reclamation's Water and Related Resources Appropriation. In addition, Interior has entered into numerous contracts, grants, and cooperative agreements for individual projects.

Contracting and Improved Water Management

This category includes provisions in the Act for renewing CVP contracts, and the management of water supplied by the CVP. Changes to be implemented by Interior included new contracting terms and conditions, and new programs for water transfers, water conservation, and water banking.

Contract Renewals

The CVPIA restricts new contracts and the long-term renewal of existing contracts for water until the PEIS process is completed, and provides for interim short-term renewal of expiring contracts. Reclamation has completed two interim contract renewal processes to date.

Reclamation complied with the environmental review process to develop renewal guidelines and, in 1995, negotiated a standard form of interim renewal contract for purposes of renewing all 67 CVP contracts. Fifty-four were renewed prior to their expiration, 10 were consolidated into one, one contractor failed to renew, and one contract was dissolved. In 1997 Reclamation prepared a "binding agreement" form contract for future short-term renewals which commits all CVP long-term water contractors to agree to renew their existing contract prior to its original termination and immediately after completion of the PEIS. All 54 interim contracts have been subsequently renewed at least once. The last set of successive interim renewal contracts was completed in February 1998.

Water Transfers

Interior developed Interim Water Transfer Guidelines to establish conditions for transfer of CVP water until final rules and regulations for the CVPIA are completed. Interior also prepared an Administrative Proposal, in which the transfer

process was refined. In response to requests by contractors to streamline the water transfer process, each of the major divisions within the CVP developed a blanket approval procedure for water transfers. A number of short-term transfers and three long-term transfers have been approved, all involving transfers within the CVP service area.

Water Conservation

Reclamation has nearly completed implementation of the water conservation program specified in the Act. A Water Conservation Advisory Center was established in Sacramento in 1993, and has been relocated to Folsom. Other centers are being planned or implemented throughout the state, including a Virtual Water Conservation Center on the Internet.

Reclamation's Water Conservation Office has prepared Criteria for Evaluating Water Conservation Plans (1993 and revised in 1996) for the guidance of water and irrigation districts. Reclamation has reviewed the water management plans submitted, and has found more than 70 adequate under CVPIA. To support water conservation efforts, Reclamation developed a database that provides each water district with specific information to enable the district to prepare its annual plan update. The database also provides examples of successful programs and capabilities for sharing information and research.

Reclamation's Water Conservation Office also developed guidelines and criteria for a cost-share program for water conservation projects, and issued four proposal solicitations. This program received little interest from CVP contractors and was ended in late 1997.

Anadromous Fish Restoration

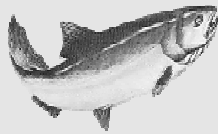
Interior's efforts to restore anadromous fish in the Central Valley are focused mainly through two "Action Categories": Anadromous Fish Habitat Restoration and Anadromous Fish Structural Measures. Most of these efforts fall within section 3406(b) of the Act, but all CVPIA provisions potentially provide some level of benefit for anadromous fish.

The CVPIA provides two types of guidance for anadromous fish restoration; specific directed actions, like the construction of fish screens at Glenn Colusa Irrigation District's Hamilton City Pumping Plant and at a Contra Costa Pumping Plant; and directed programs, like the Clear Creek Fishery Restoration Program and the Gravel Replenishment and Riparian Habitat Protection Program. Because it was necessary to better define these directed programs, Interior developed large scale planning processes that included other agencies, the public, and stakeholder groups.

The Anadromous Fish Restoration Program (AFRP) was developed by the Service and Reclamation to help guide Interior to make all reasonable efforts to at least double the natural production of anadromous fish in Central Valley rivers and streams. The AFRP, largest of the directed programs under CVPIA, influences or is influenced by most of the other programs created by the Act. Formation of the AFRP and the creation of its program plan were guided by a coalition of senior fish experts from the Service, Reclamation, Environmental Protection Agency, National Marine Fisheries Service, and California's Departments of Fish and Game and Water Resources. The program plan, containing nearly 300 prioritized restoration actions and evaluations, provides Interior's overall goals, objectives, and strategies for providing anadromous fish restoration in the Central Valley. It includes other anadromous fish restoration actions found in the CVPIA, and partitions all efforts by watershed. The AFRP program plan has become the cornerstone of many actions aimed at restoring natural production of anadromous fish in the Central Valley, and includes partnerships, local involvement and public support. Although the program plan includes many of the directed actions in the CVPIA, that portion of the AFRP focusing on implementation concentrates on high priority actions in the plan that are not directed actions or being implemented as part of other CVPIA directed programs.

Restoration actions for anadromous fish have focused in four geographic areas:

Sacramento-San Joaquin Delta - Emphasis has been on offsetting effects of CVP and SWP export facilities (entrainment, impingement, diversion, and increased predation).



Anadromous Fish in the Central Valley

Anadromous fish are fish that originate in freshwater streams and migrate to the ocean, returning to their origins to spawn and die. California's stocks of anadromous fish (salmon, steelhead, striped bass, sturgeon) have greatly decreased from their historic numbers. A century of land uses such as mining, logging, farming, and urban development--and water development to serve them--has greatly reduced the habitat available to fish. Although fish losses also result from natural weather conditions (floods, droughts, ocean warming) habitat deterioration is known to be a major cause in the Central Valley.

Salmon are present in the Sacramento River system year-round. Four separate runs of Pacific Coast salmon rely on the Sacramento River system, distinguished by the time of year they begin their upstream migration. The winter-run chinook (king) salmon and the spring-run coho (silver) salmon have been designated endangered species.

At both times in their freshwater life cycle, the fish are dependent on an adequate range of habitat that provides spawning gravel, adequate flows for passage and temperature control, protection from predators, and safety from diversion intakes, pumps, and obstructions such as dams. The AFRP had to address all these habitat needs for the restoration efforts to work. It was also important to coordinate with other programs, because an action to improve conditions for one run could be harmful for another.

Sacramento River Tributaries - Actions have focused on riparian and shaded riverine aquatic habitat restoration, primarily on tributaries; improved access to upstream habitat; and reduction of losses at diversions, especially for spring-run chinook salmon and steelhead.

Sacramento River - Actions have focused on restoration of spawning habitat and acquisition of riparian lands to improve rearing habitat, especially for winter-run chinook salmon.

San Joaquin River and Tributaries - Actions focused on restoration of river channels, spawning gravels, and riparian cover and on the elimination of predator habitat on tributaries.

Success of Interior's anadromous fish restoration effort depends on the successful linkage of all CVPIA programs and actions, and those related efforts ongoing under other processes. Increasing the natural production of anadromous fish in the Central Valley is an ecosystem-level effort. It will require the provision of adequate instream habitat including appropriate management of available water supplies, appropriate adult access to spawning areas, and protection of juveniles from diversion. Toward that goal, monitoring and further studies under CVPIA will be essential to assess the success of any action and provide the ability to adaptively manage actions in the future.

Anadromous Fish--Habitat Restoration

Habitat restoration actions that have been completed include acquisition and dedication of water for additional instream flows, channel enhancement, gravel replenishment, riparian area restoration, erosion control to decrease fine sediment, and adaptive management to improve conditions for anadromous fish.

Interior has furnished dedicated water to benefit anadromous fish, based on AFRP targeted needs, since 1993. This water was applied to improve adult migration, spawning, egg incubation, and fry and juvenile rearing and migration, especially in the Delta. Additionally, Interior has purchased nearly 315,000 acre-feet of supplemental water from willing sellers to meet anadromous fish needs in both the Sacramento and the San Joaquin basins, and provided approximately 17,000 acre-feet of water annually for anadromous fish on Butte Creek as a result of moving a diversion to the Sacramento River.

Other anadromous fish habitat restoration efforts have occurred within 30 miles of river and stream corridors, valley-wide. These actions included the improvement of instream habitats by focusing on erosion control, channel improvement, placement of over 68,000 tons of spawning gravel, and the restoration of adjacent-to-stream terrestrial habitats including acquisition and/or restoration of nearly 4,300 acres of riparian habitat. Additionally, with the participation of DFG, the

program to replenish gravel and protect riparian habitat has developed long-term plans for the Sacramento, American, and Stanislaus rivers and placed gravel in the Sacramento and Stanislaus rivers.



Chinook salmon spawning at a gravel replenishment site on the Stanislaus River

The Clear Creek Fishery Restoration Program is an example of a program focusing many of these actions in a single watershed to restore anadromous fish habitat including efforts to increase flows, replenish spawning gravel, control erosion, restore stream channel, and evaluate the removal of McCormick-Saeltzer Dam--a current impediment to upstream salmon and steelhead migration.

Another program, the Trinity River Fishery Flow Evaluation Program, has completed flow evaluation studies, and an EIR/EIS has been prepared to analyze the range of alternatives for restoring and maintaining fish populations downstream of Lewiston Dam.

Anadromous Fish--Structural Measures

Anadromous fish structural measures include devices to improve instream habitat, like the Temperature Control Device on Shasta Dam; construction, modification, and removal of structures that influence fish migration, like fish ladders and screens, diversions, and dams; improvements to the Coleman National Fish Hatchery; and construction of the Livingston Stone Fish Hatchery. A significant number of these projects have been completed, and others are in progress. Efforts associated with some of these structural measures have been able to proceed rapidly because planning was already in progress prior to passage of the CVPIA and/or co-funding was available through partnerships.

The most impressive structural project completed under CVPIA is the Shasta Temperature Control Device (TCD). This innovative structure permits the selective release of water from Shasta Dam to provide cooler water for fish without bypassing the powerplant. The TCD, completed in 1997, has prevented the loss of power supplies and millions of dollars in revenues from hydroelectric power in its two years of operation.

Since 1993, an additional 32 major anadromous fish passage structural improvement actions were completed, improving adult passage to spawning areas and protecting juvenile fish in their migrations to the sea. As a result of the placement of 10 fish screens; 5 fish ladders; improvements at 14 diversions, including the removal of 4 dams; construction of a bypass facility; and modification of operations at several CVP facilities, access and survival of anadromous fish has been improved in over 130 miles of Central Valley rivers and streams.

Programs to add or improve fish screens have increased the survival of juvenile anadromous fish as they migrate to the sea, while benefitting CVP contractors by potentially increasing the reliability of their water supplies. Interior has issued 19 grants for screening projects in the Central Valley under the Anadromous Fish Screen Program. Construction has started on 16 of these, and 10 have been completed.

The Delta is one of Interior's highest priority focus areas, because all species and races of anadromous fish migrate through the Delta--moving as adults to upstream spawning areas and as juveniles to the San Francisco Bay and the ocean. Important programs in the Delta have focused on efforts to minimize the effects of CVP and SWP export facilities on anadromous fish. Accomplishments have included improvements at the Tracy Pumping Plant, fish screen design at the Contra Costa Canal Pumping Plant, modification of operations at the Delta Cross Channel to reduce mortality of striped bass, and installation of an acoustic barrier on Georgiana Slough to redirect fish movement.

Important structural projects completed on the Sacramento River include improvements at the Red Bluff Diversion Dam to reduce fish entrainment and improve the fish ladder, and a major project to fully mitigate serious fishery impacts of the Glenn-Colusa Irrigation District's Hamilton City Pumping Plant. The current effort to design a state-of-the-art fish screening system began in the late 1980s. This program involves a multi-agency team, including Reclamation, the Service, U.S. Army Corps of Engineers, National Marine Fisheries Service, State Reclamation Board, DFG, and the District. Construction is now complete on a water control structure and access bridge. Design is completed and construction is underway on the fish screen and adjacent channel improvements.

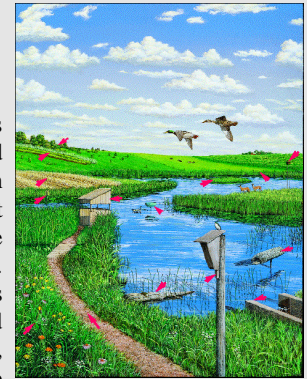


Construction under way on the open and piped fish bypass system, Glenn-Colusa Irrigation District Pumping Plant

Other structural project accomplishments include designs for modifications to the Keswick Dam fish trap, modifications to the Anderson-Cottonwood Irrigation District Diversion Dam to allow removal of its boards at higher flows, construction of a fish bypass and relocation of diversion facilities on Big Chico Creek, and installation of ozone equipment at the Coleman National Fish Hatchery.

Central Valley Wetlands

The Central Valley is 400 miles long and contains about 10 million acres of land, of which at least 4 million acres were once wetlands. Historically the rivers regularly overflowed their banks in the winter, and nearly the entire valley became seasonal wetlands. Today, only a little more than 300,000 acres of wetlands remain to support waterfowl, other migratory birds, and resident wildlife in the Central Valley.



The valley is on the Pacific Flyway, a major route for millions of North America's ducks, geese, and other migratory birds. Despite the greatly reduced habitat, Central Valley wetlands are host to large annual migrations and support 20 percent of North America's continental waterfowl populations.

Refuges and Waterfowl

The CVPIA identifies wetlands restoration as a key component of wildlife protection and enhancement in the Central Valley. The Act directs making more water available to refuges, and increasing its reliability. The Act also directs an incentives program to encourage farmers to flood and maintain fields to create additional waterfowl habitat. This can be done in some cases while still using the farmland for crops. Rice growers can flood fields to decompose rice straw, creating seasonal wetlands without interfering with farming operations.

Significant progress has been made on these programs related to refuges and waterfowl. A goal of the Supplemental Water Acquisition Program is to acquire water to upgrade refuge water supplies from Level 2 to Level 4, as defined in a Reclamation report on water needs. The total incremental increase, estimated at 163,259 acre-feet over Level 2 supplies, is to be achieved in increments of ten percent per year. This goal has been met each year by acquiring temporary water supplies since the program was established in 1993. In early 1998, Interior acquired the first

6,300 acre-feet of permanent water supply to help meet Level 4 requirements. (Level 4 is the full water allocation for optimum management of wetlands in Reclamation's 1989 Refuge Water Supply Report.)

Since 1993, Reclamation has increased the reliability of existing supplies to managed wetlands that have conveyance systems. Under the Refuge Water Supply and Conveyance Program, Interior executed six water wheeling agreements to deliver up to 395,300 acre-feet of water to wetlands. Construction has started on five new conveyance facilities, of which three have been completed. In 1998 a cooperative agreement was reached with Glenn-Colusa Irrigation District which will also enable expansion of future deliveries to west Sacramento Valley refuges.



The Stoney Creek Siphon helps to provide water supplies to the Sacramento National Refuge Complex

The Agricultural Waterfowl Incentive Program has been highly successful. During the winter of 1997-98, 41 farmers participated in the program and created 22,314 acres of habitat for wintering migratory waterfowl. Monitoring showed that as many as 40,000 ducks or geese used these newly flooded fields. Herons, egrets, cranes, ibis, and several species of shore birds also used these new seasonal wetlands, adding to the species diversity of the areas. Program participation for winter 1998-99 has increased substantially. A total of 41,055 acres were flooded, almost double the acreage flooded in 1997-98.

Other Fish and Wildlife

This category includes mitigating actions for other impacts of the CVP that are not specifically provided for elsewhere in the Act. Actions include the Habitat Restoration Program and the Land Retirement Program.

The Habitat Restoration Program has completed the identification, protection and restoration of habitat suitable for conservation of native species in many areas of the Central Valley. Restoration efforts focused on habitats and species most dramatically affected over the last 60 years. This program has obtained partner contributions of nearly \$48 million, and has helped to protect nearly 80,000 acres of valuable habitat. Partnership efforts have included acquisition of the Pine Hill Ecological Reserve in El Dorado County and the Allensworth Ecological Reserve in Tulare County.

A San Joaquin River Riparian Habitat Restoration Program has been developed and implemented to improve desirable plant and animal habitat along the river from Friant Dam to the San Joaquin's confluence with the Merced River.

The Land Retirement Program has been developed in concert with habitat restoration and other CVPIA program goals. The acquisition of poorly suited agricultural lands to use for the conservation of native species will have significant benefits for the ecosystem. It will contribute to the solution of drainage problems, improve water quality, make more water supplies available, and allow improvement of wetlands habitat.

One of the goals of the Land Retirement Program is to retire agricultural lands with poor drainage and convert the lands to wildlife habitat uses and the recovery of endangered species. Drainage problems are prevalent on the west side of the San Joaquin Valley, where the trace element selenium occurs naturally in soils and can reach levels toxic to wildlife. By stopping irrigation of these lands--and the resulting high salt and selenium concentrations in the drainage water--water

quality will be improved, and water will be made available for other uses.

Interior has developed a voluntary land retirement program to buy land poorly suited for agricultural uses from willing sellers. The program stresses adaptive management and is considered a pilot, or demonstration, program. In 1996, the program began acquiring land in the Westlands Water District for a demonstration project. In 1998, an agreement was reached with Westlands Water District for the district to share the land costs in exchange for water. After the 3- to 5-year demonstration program is complete, accumulated information will be used to conduct an ecological risk assessment and complete a programmatic NEPA document.

The program has also acquired Prospect Island in the Delta. This island contains 1,228 acres of existing and potential wildlife and fisheries habitats. This is another example of implementing individual sections in concert with other CVPIA goals to realize the greatest overall benefits.

Monitoring

A monitoring program was essential to provide the ability to assess the results of CVPIA implementation over the years, and to make needed adjustments to improve results. The Service evaluated existing fish monitoring programs in 1994 to provide the baseline for a program to evaluate the biological results and effectiveness of CVPIA actions. The assessment will also be used to identify additional actions that may be required to meet the goals of the Act.

In 1995 and 1996 the Comprehensive Assessment and Monitoring Program (CAMP) was developed. The program includes a Conceptual Plan for evaluating the overall success of various actions; and an Implementation Plan to identify details of actual field work, data processing, and needed evaluations.

The program has also completed a riparian mapping program for the Sacramento River and

tributaries. Data management has been implemented through the Interagency Ecological Program, and CAMP is helping to coordinate monitoring plan development for CALFED. The first annual report of CAMP was also prepared to provide review and analysis of program data collected from 1995 to 1997. The second annual report covers 1998.

Studies, Investigations and Modeling

Extensive studies, investigations and modeling have been required to develop the data needed to implement the CVPIA. They have been important to provide information needed to make decisions that affect CVPIA actions and to evaluate the probable results of proposed changes. These are a necessary first step in planning for many CVPIA actions. Many studies, investigations and models have been prepared jointly with, or contracted to, other agencies.

Numerous studies have been completed, and others are ongoing, in connection with efforts to restore anadromous fish. These include the analysis of CVP flow fluctuations, releases on the American and Stanislaus Rivers, carryover storage requirements, evaluation of temperature control, tributary enhancement, and major impacts of CVP reservoir facilities and operations on anadromous fish.

In other programs, the Central Valley Wetlands Water Supply Investigations has developed a GIS database to identify private wetlands and additional water needs, as well as to identify potential water supplies for supplemental wetlands.

Ecological and hydrologic models are being prepared to evaluate effects of various operations of water facilities and systems in the Sacramento, San Joaquin, and Trinity River watersheds. This is a cooperative effort with the California Department of Water Resources, United States Geological Survey (USGS) and others to evaluate potential impacts of various CVP actions.

A study has also been completed to develop a

least-cost plan to increase the yield of the CVP

by the amount dedicated to fish and wildlife purposes in the CVPIA. This plan was submitted to Congress in 1996.

PART IV - ASSESSING THE RESULTS

The Ecosystem Response

From all indications, the CVPIA has had very positive results from its efforts for protection, restoration and enhancement of fish and wildlife in the Central Valley. In the years since CVPIA implementation began, the ecosystem response has been very positive. The numbers of anadromous fish returning to Central Valley rivers and streams have increased, and salmon have returned to spawn in areas where they have not been seen for many years. Thousands of ducks and geese and other migrating birds and waterfowl have used new wetlands areas the CVPIA programs have created, and avian diseases have declined.

While the ecosystem is also responding to many other factors, it is reasonable to assume that some of the beneficial effects are due to CVPIA actions. Interior recognizes that there is some difficulty in separating the effects of CVPIA actions from other influences. California experienced an extended drought from 1987 to 1992, which stressed some ecosystems. The past five years have been above normal wet years, with some damage to natural habitats from flooding, but overall benefits from the increased water. Other factors, such as introduced nonnative species, also affect fish and wildlife and their ecosystems. It may take many years of study and monitoring before the results of all CVPIA actions can be identified with confidence, apart from the other causes of ecosystem changes.

Interior has developed and implemented programs to monitor the results of CVPIA actions and assess their effectiveness in terms of ecosystem response. The most comprehensive of these programs is the Comprehensive Assessment and Monitoring Program (CAMP), established under Section 3406(b)(16) to monitor fish and wildlife resources to assess the biological results and effectiveness of actions.

Separating CVPIA implementation effects from other influences requires a thorough understanding of the ecosystem of the Central Valley. The

Ecosystem and Water System Operations Models, specified in Section 3406(g), will furnish improved scientific understanding of the Central Valley ecosystem and hydrology, and the interactions of various factors in surface and groundwater, watersheds, reservoirs, and fish and wildlife habitats. The knowledge gained, together with the use of these models, will help Interior to better assess the results of CVPIA actions over time.

Most actions and monitoring programs have been in effect for only a few years. At this time it is possible only to identify trends in fish and wildlife populations that align with Interior's CVPIA efforts and most likely indicate a positive response. When monitoring programs have been in effect longer, there will be a more scientific basis to identify CVPIA effects and to evaluate results.

Extensive research by federal, state and local agencies has followed the changing Central Valley environment for many years. Data from this research have been used to discern environmental trends during the 1993 through 1998 period for this report. Though it does not identify the portion of the changes attributable to CVPIA, the trends aligned with CVPIA actions are a good indication that at least some part of these trends are in response to the actions.

Anadromous Fish Species

Chinook salmon have received high priority in CVPIA restoration efforts. While the numbers along the entire west coast seem to be declining, those numbers returning to the Central Valley and caught off California's coast, as identified by the Pacific Fishery Management Council (Figure 1), have increased on average since 1992. While factors like hydrology and fishing practices have had some effect, review of historical records provides no clear relationship between these factors and anadromous fish population trends valley-wide.

Placement of gravel in the Sacramento and Stanislaus Rivers resulted in benefits to

Figure 1

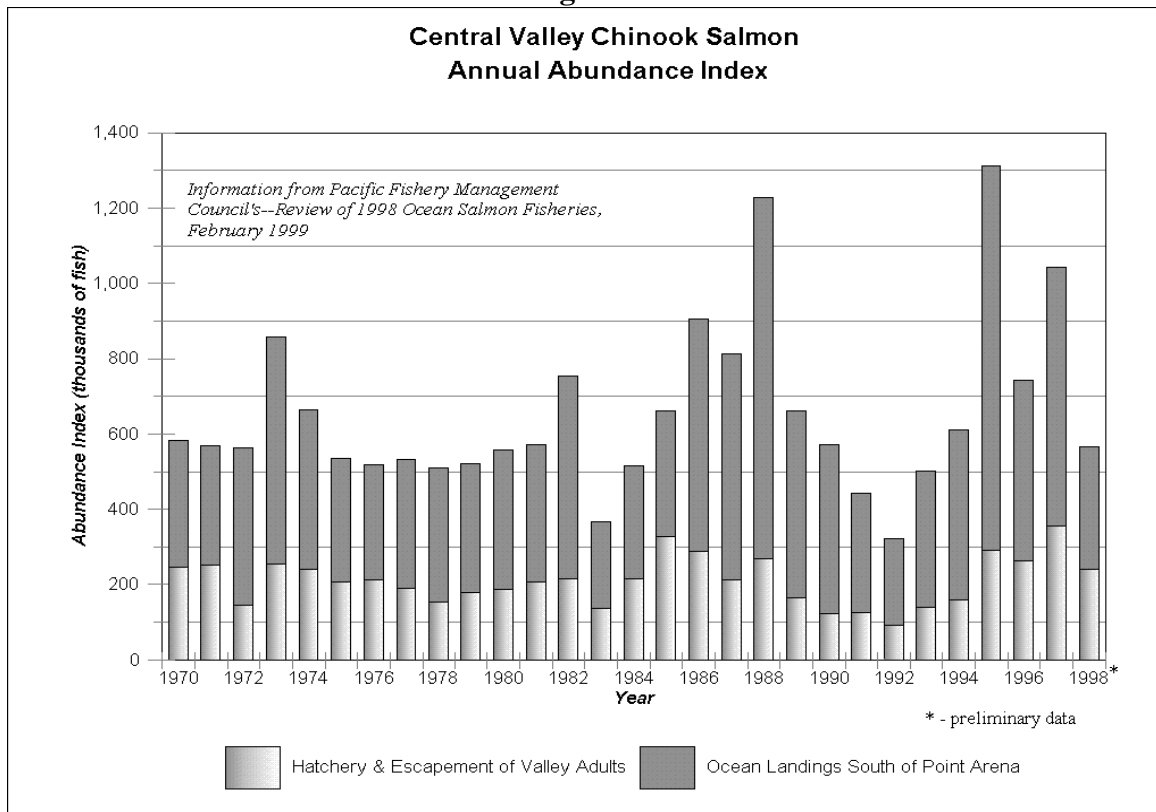
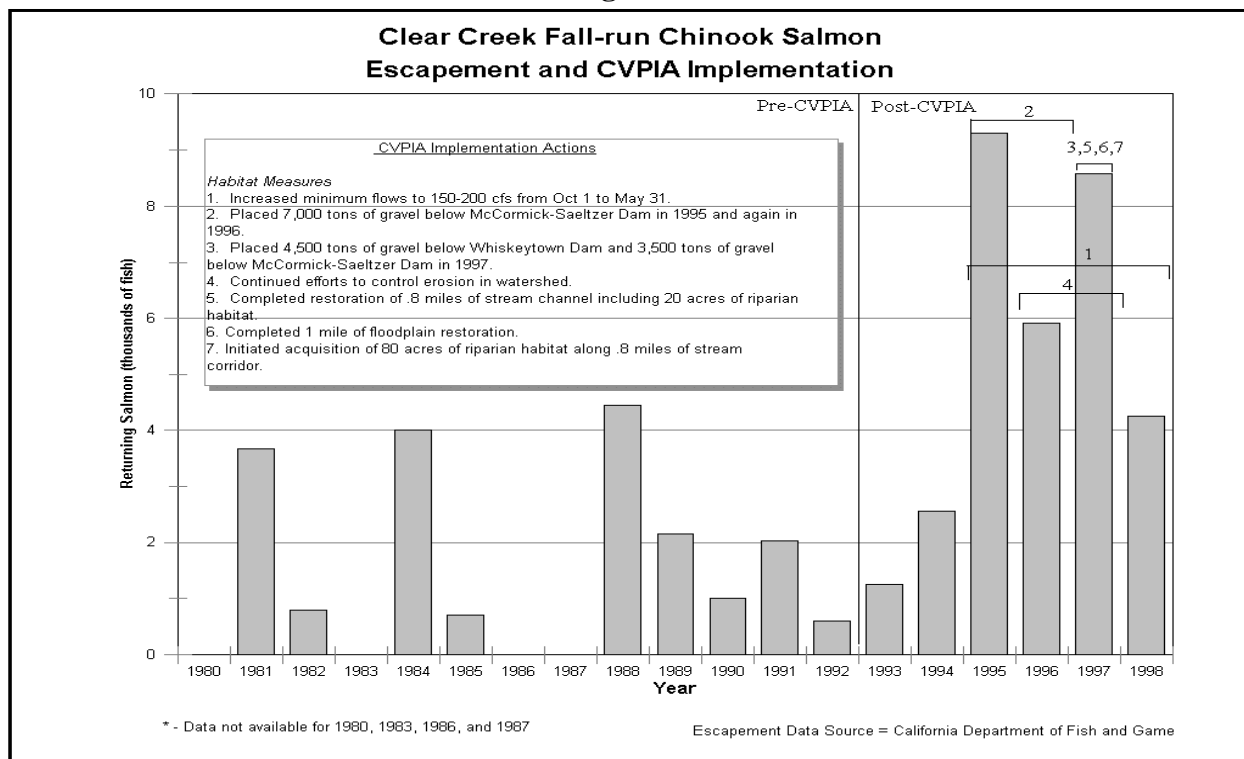


Figure 2



anadromous fish species during the same season. Associated with these placements, spawning returned where there had been none for many years. Other actions will take more time to show results. Benefits to fry and juveniles may not be apparent except from the numbers of adult fish returning three years later to spawn.

There is good evidence of the success of CVPIA actions in the Clear Creek and Butte Creek watersheds. After years of diversion and other human uses, anadromous fish populations were very low in these streams. Interior has focused CVPIA efforts in these watersheds since 1993, and salmon populations have increased dramatically in both creeks (Figures 2 and 3).

Implementation of actions under the CVPIA may be providing the necessary momentum for these increases in chinook salmon in the valley. Even if CVPIA actions are only partly responsible, the increased abundance is certain evidence that the ecosystem is resilient and can support greater fish populations. This is encouraging for the probable success of CVPIA efforts, and reinforces the importance of continuing the restoration efforts.

Refuges and Waterfowl

In the Central Valley, most of the historic wetlands have been converted to other uses. Less than 5 percent remain of the wetlands that existed 150 years ago, yet these wetlands support 20 percent of North America's continental waterfowl populations. The refuges operate on what is, in ecosystem terms, a critical edge. Thus, any wisely applied addition to the water supply, or increase in the acreage under management, generates a reduction in the habitat deficit, rather than a surplus. As a result, the benefits of CVPIA efforts have made a dramatic difference.

Central Valley wetlands receiving CVP water supplies have increased by more than 20,000 acres since passage of the CVPIA. The average annual increase was above 13,000 acres, a 35 percent increase (Figure 4). These increases in overall wetland acreage may explain the 50 percent decrease in waterfowl disease related mortality in

some wetland areas as the birds spread out over a larger surface area.

Since the passage of the CVPIA, Sacramento Valley areas receiving CVP water have seen a 20 percent increase in waterfowl use and a significant decline in water-borne wildlife diseases, according to California Waterfowl Association data.

On Grassland Water District lands, for example, moist-soil summer irrigation or soil salinity treatments were possible before the CVPIA. Summer water has allowed semi-permanent pond management to increase from 700 to over 3,500 acres, and spring shallow water maintenance from 7,000 to an estimated 21,000 acres (Figure 5). The result was a net 300 percent increase in waterfowl use in some areas as early as 1995.

Other increases in waterfowl use were obvious around the Valley. An 18 million waterfowl-use day increase occurred at the Gray Lodge Wildlife Area in 1995. In other areas, waterfowl shore bird food production increased by more than 300 percent, with a corresponding increase in use.

At the Kern National Wildlife Refuge, populations of federally-listed threatened species increased in response to a 2,000-acre enhancement of wetland acreage, a 230 percent increase. These species include the peregrine falcon, southern bald eagle, tri-colored blackbird, and white-faced ibis.

The improvement of conditions at refuges increases the support for a very long list of algae, plants, invertebrates and vertebrates, including many special-status species. Protecting these species, which are interdependent, makes the overall system more stable and increases its ability to resist changes despite impacts from outside forces. These areas can be seen as "buffers" against ecological trauma in the form of disease and disaster. Refuges may help restrict the spread of plant or animal diseases and help in the recovery of watersheds after flood or fire.

Figure 3

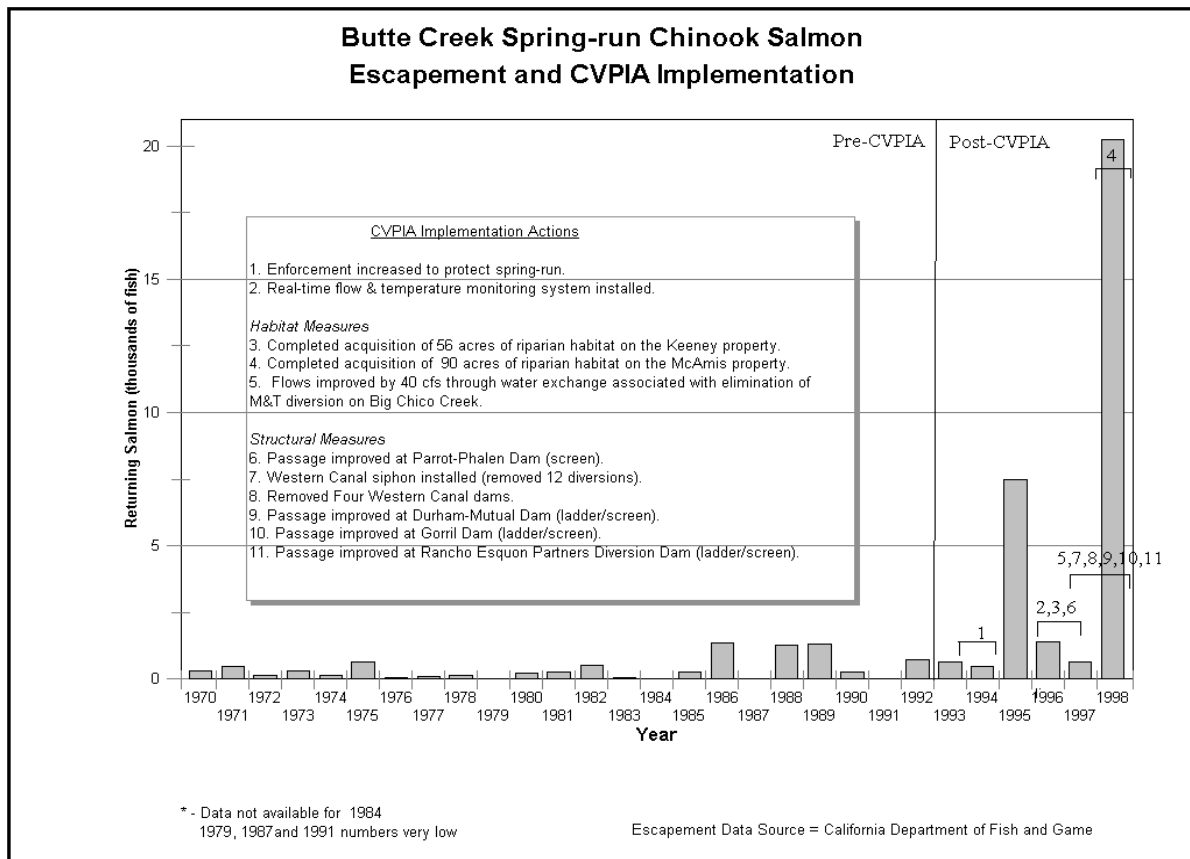


Figure 4

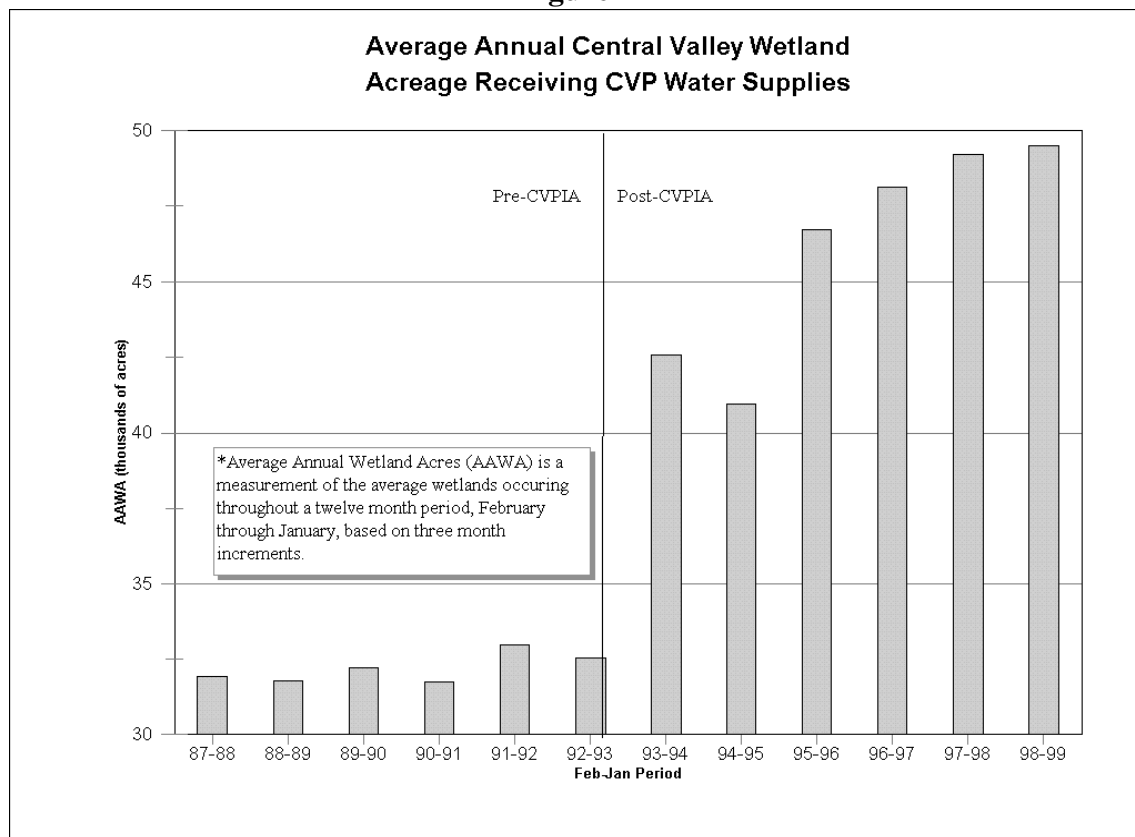
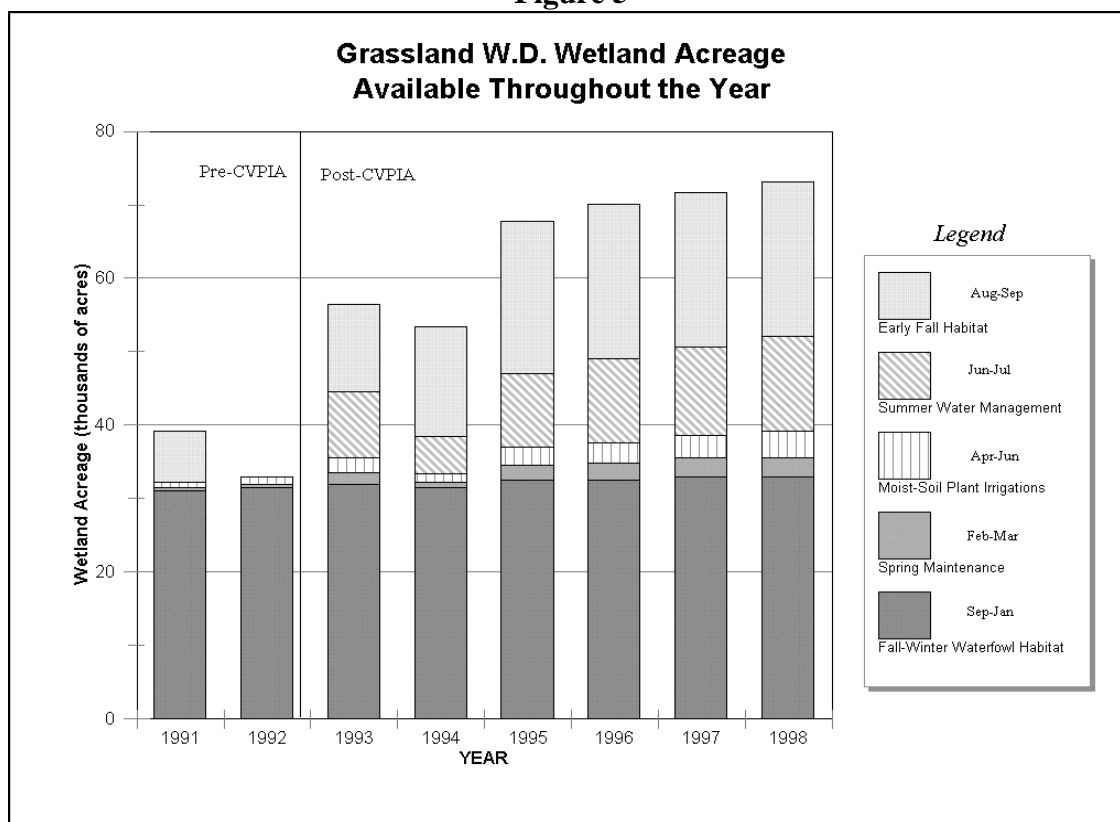


Figure 5



Increasing water supplies to wetlands also has the effect of improving water quality. The increased seepage has had the benefit of biofiltration, thus entering the groundwater as a much more valuable contribution to the overall water supply. Providing firm, quality water supplies is reducing high levels of selenium in waterfowl and shore birds spending the winter in the Grasslands area of the valley. In a report on selenium in aquatic birds from the Central Valley, 1986-1994, U.S. Fish and Wildlife Service scientists noted that application of freshwater resulted in the decline of selenium contamination in mallard and northern pintail ducks, American coots, and black necked stilts.

Other Fish and Wildlife

Since 1993, CVPIA actions to preserve, restore and enhance other habitats and species not specifically provided for in Section 3406 have focused on those most dramatically affected over the last 60 years. To date, this effort has allowed Interior to collaborate with numerous partners in

the acquisition and restoration of terrestrial habitats on nearly 80,000 acres of land valley-wide.

These acquisitions resulted in the preservation of many native habitats including riparian, wetland, grassland, hardwood woodland, and vernal pool habitats (Figure 6). This has benefited numerous fish and wildlife, including Federal and State listed species. In many areas, acquisitions have already protected habitat for listed species like the giant garter snake, vernal pool plant and invertebrate species, and gabbro soil plant species in the foothills of the Sierra Nevada. Efforts are underway to track the benefits of these actions.

An incentive program for farmers to flood fallow fields has created seasonal wetlands for a host of wildlife species including waterfowl and shore birds. This program resulted in nearly 41,000 acres of additional wetland habitat in 1998. This increase in wetland area during peak waterfowl use, in combination with increases provided by the delivery of additional Level 2 and Level 4

water supplies, seems to have contributed to the decrease in overall waterfowl disease-related mortality.

The Land Retirement Program has enabled the acquisition of over 2,800 acres of land in the valley. The acquisition of Prospect Island provided for the preservation and restoration of 1,228 acres of wetland habitat in the Delta,

benefiting both fish and wildlife species. The retirement of 1,586 acres of agricultural land in the San Joaquin Valley began an evaluation process which will shape the program in the future. As the drainage problem is reduced, this program should help recover the aquatic and terrestrial environments in the San Joaquin Valley.

PART V - SUMMARY

The accomplishments associated with the enactment of CVPIA are described in Appendices A-H. These appendices contain detailed information about the enactment of various

CVPIA sections, including financial data. The accomplishments are summarized in Table 1 below. Figures 6-10, which follow Table 1, show the anadromous fish and terrestrial restoration activities associated with these accomplishments.

Table 1 - Summary of Accomplishments

CVPIA Section	Program or Project	Status
Appendix A: Administrative Processes		
3406(h)	Cost-Share Agreement with State of California	Signed 6/27/94
3407	Restoration Fund	Established; collected \$171.4 million (1993-98)
3408(a)	Rules and Regulations	Interim guidelines & criteria developed for 10 sections; Administrative Proposal process is ongoing; final rules will follow PEIS Record of decision
3409	Programmatic EIS	Draft PEIS released November 1997; final completed October 1999
Appendix B: Contracting and Improved Water Management		
3404	Contracting	Negotiated and executed 54 interim renewal contracts; interim renewal contracts with Friant 14; executed 44 of 45 binding agreements for early renewal of long-term contracts; collected specified charges; completion of activities for most interim renewal and long-term contractors scheduled by November 2000
3405(a)	Water Transfers	Developed & streamlined transfer approval process within CVP; approved transfers of 1.5 million acre-feet for agricultural and municipal uses and 200,000 acre-feet for Level 4 refuge needs; no transfers yet approved outside CVP service area
3405(b) and (e)	Water Conservation	Established water conservation and Advisory Center; developed criteria, database to track plan implementation; approved 70 water management plans; provided cost-share and technical help
3408(i)	Water Conservation Projects	Program established, but no serious interest from CVP contractors before 1999 sunset date

Table 1 (Cont'd) - Summary of Accomplishments

CVPIA Section	Program or Project	Status
Appendix C: Anadromous Fish - Habitat Restoration		
3406(b) (1)	Anadromous Fish Restoration Program	Established AFRP, developed Restoration Plan to guide implementation of efforts to increase natural production of anadromous fish, acquired nearly 4,300 acres of riparian habitat, partnered with local watershed groups, initiated efforts to eliminate predator habitat in San Joaquin River tributaries, and provided for fish ladder and screens at two diversion structures on Butte Creek.
3406(b) (2)	Dedicated CVP Yield	Implemented interim management of 800,000 acre-feet of water dedicated to CVPIA purposes and assessed benefits; ongoing
3406(b) (3)	Supplemental Water Acquisition Program (Anadromous Focus)	Acquired 315,000 acre-feet from 1993-98
3406(b) (12)	Clear Creek Fishery Restoration	Increased flows; initiated channel restoration; added spawning gravel; took erosion control measures to decrease fine sediment input; ongoing evaluation of dam removal
3406(b) (13)	Gravel Replenishment and Riparian Habitat Protection	Developed long-term plans for Sacramento, Stanislaus, and American Rivers; placed gravel in Sacramento, Stanislaus Rivers and continued work on gravel management program on American River (with DFG)
3406(b) (23)	Trinity River Fishery Flow Evaluation Program	Conducted flow evaluation studies; completed EIR/EIS to analyze range of alternatives for restoring and maintaining fish populations downstream of Lewiston Dam
Appendix D: Anadromous Fish - Structural Measures		
3406(b) (4)	Tracy Pumping Plant Mitigation	Improved predator removal; increased biological oversight of pumping; developed better research program, new lab and aquaculture facilities; improved and modified existing facilities
3406(b) (5)	Contra Costa Canal Pumping Plant Mitigation	Established cooperative program for fish screen project for Rock Slough intake of Contra Costa Canal; specs, drawings, and environmental evaluation completed

Table 1 (Cont'd) - Summary of Accomplishments

CVPIA Section	Program or Project	Status
3406(b) (6)	Shasta Temperature Control Device	Completed 2/28/97; since operated to reduce river temperatures without stopping power generation operations [cost \$80 million; loss in power generation pre-TCD was \$35 million over 7 years]
3406(b) (10)	Red Bluff Dam Fish Passage Program	Completed interim actions and modification of Red Bluff Diversion Dam to meet needs of fish and water users; ongoing
3406(b) (11)	Coleman National Fish Hatchery Restoration and Keswick Fish Trap Modification	Determined water treatment improvements; installed ozonation equipment; established Livingston Stone Fish Hatchery; designed fish trap improvements
3406(b) (17)	Anderson-Cottonwood I.D. Fish Passage	Modified dam and operations to improve fish passage; designed new fish ladders and screens
3406(b) (20)	Glenn-Colusa I.D. Pumping Plant	Started construction of fish screen and channel improvements; completed water control structure and access bridge
3406(b) (21)	Anadromous Fish Screen Program	Established program; accepted 19 proposals, construction started on 16, with 10 completed
Appendix E: Refuges and Waterfowl		
3406(b) (3) & (d)(2)	Supplemental Water Acquisition Program (Refuge Focus)	Acquired nearly 240,000 acre-feet of interim and long-term water for refuges; ongoing
3406(b) (22)	Agricultural Waterfowl Incentives Program	Created new waterfowl habitat; targeted additional waterfowl habitat
3406(d) (1,3-5)	Refuge Water Supply and Conveyance	Acquired additional water supplies; executed 6 interim "wheeling" agreements; began construction on 5 conveyance facilities, completed 3; ongoing
Appendix F: Other Fish and Wildlife		
3406(b) (1)	Habitat Restoration Program	Established Habitat Restoration Program and San Joaquin River Riparian Habitat Restoration Program; helped acquire over 78,000 acres of native habitat

Table 1 (Cont'd) - Summary of Accomplishments

CVPIA Section	Program or Project	Status
3408(h)	Land Retirement Program	Established land retirement program to decrease drainage problems in San Joaquin Valley and enhance wildlife habitat and recovery of endangered species; acquired 2,814 acres from willing sellers; ongoing
Appendix G: Monitoring		
3406(b) (16)	Comprehensive Assessment and Monitoring Program	Established program to evaluate success of restoration efforts; ongoing
Appendix H: Studies, Investigations and Modeling		
3406(b) (9)	Eliminate Flow Fluctuation Losses	Coordinated management of CVP facilities; developed standards to minimize fishery impacts from flow fluctuation; initiated studies on American and Stanislaus Rivers; ongoing
3406(b) (19)	Shasta and Trinity Reservoir Carryover Storage Studies	Ongoing studies [related studies funded under 3406(b)(9)]
3406(c) (1)	San Joaquin River Comprehensive Plan	Initiated evaluation to reestablish anadromous fish from Friant Dam to Bay-Delta Estuary; due to public opposition to continued study, Congress dropped funding
3406(c) (2)	Stanislaus River Basin Water Needs	Prepared Stanislaus and Calaveras River water use program and ESA report; additional studies ongoing concurrent with development of Stanislaus River long-term management plans
3406(d) (6)	Central Valley Wetlands Water Supply Investigations	Identified private wetlands and water needs, alternative supplies; developed GIS database to identify potential water supplies for supplemental wetlands; preparing report
3406(e) (1)	Investigation on Maintaining Temperatures for Anadromous Fish	Completed field investigations on interaction between riparian forests and river water temperatures and on effects on water temperature of vegetation, irrigation return flow and sewage effluent discharge; ongoing
3406(e) (3, 6)	Investigations on Tributary Enhancement	Completed report in 1998 on investigations to eliminate fish barriers and improve habitat on all Central Valley streams (not regulated by CVP; but tributary)

Table 1 (Cont'd) - Summary of Accomplishments

CVPIA Section	Program or Project	Status
3406(f)	Report on Fishery Impacts	Completed report in 1995 describing major impacts of CVP reservoir facilities and operations on anadromous fish
3406(g)	Ecological and Hydrologic Models	Developing models and data to evaluate effects of various operations of water facilities and systems in Sacramento, San Joaquin, and Trinity River Watersheds (to evaluate potential impacts of various CVP actions; cooperative effort with DWR, USGS, others); ongoing
3408(j)	Project Yield Increase (Water Augmentation Program)	Developed least-cost plan considering supply increase and demand reduction opportunities

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10